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## **EUROPEAN PATENT APPLICATION**

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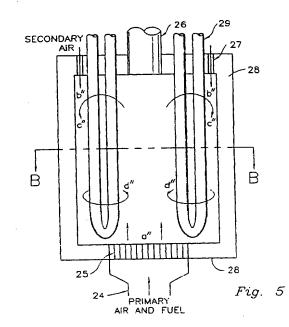
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- (54) Method and apparatus for reducing NOx emmissions in a gas burner
- (57) A vertical furnace comprising a low NOx gaseous fuel burner comprising:

a primary fuel gas and primary air inlet (24), a burner array (25) located in a wall (28) of said vertical furnace and connected to said primary air and fuel gas inlet (24) for projecting said primary air and fuel outwardly into said furnace, said primary air and fuel being combusted and producing spent gases, a plurality of secondary air vents (27) defined in a wall (28) of said furnace for supplying secondary air to said furnace,

wherein said secondary air vents (27) are positioned relative to said burner array to effect mixing of said secondary air with said spent gases inside said furnace to produce diluted air and to recirculate said diluted air inside said furnace for combustion with said primary air and fuel to reduce NOx emissions.



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## **EUROPEAN SEARCH REPORT**

Application Number EP 01 10 5492

DOCUMENTS CONSIDERED TO BE RELEVANT		
Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.CL7)
EP 0 562 710 A (ZINK CO JOHN) 29 September 1993 (1993-09-29) * column 2, line 53 - column 5, line 6; figures 1,5 *	1-3,7,9	F23C9/00 F23D14/02
NL 9 102 101 A (VITO TECHNIEKEN B V) 6 May 1992 (1992-05-06) * page 4, line 2 - page 5, line 13 * * page 5, line 36 - page 6, line 16 * * figure 1 *	1-3,7,9	
GB 833 087 A (PETRO CHEM PROCESS COMPANY INC) 21 April 1960 (1960-04-21) * figure 1 * * page 1, line 56 - line 63 * * page 2, line 116 - page 3, line 103 *	1,9	
EP 0 511 878 A (CALLIDUS TECH INC) 4 November 1992 (1992-11-04) * column 1, line 40 - column 2, line 36 * * figure 1 *	1,2,4-6, 8,10	TECHNICAL FIELDS SEARCHED (Int.Cl.7)
US 5 316 469 A (MARTIN MICHAEL J ET AL) 31 May 1994 (1994-05-31)  * column 1, line 15 - line 19 *  * column 3, line 41 - line 65 *  * column 5, line 20 - line 59 *	1-5,9.10	F23C
US 4 575 332 A (OPPENBERG ROLF ET AL) 11 March 1986 (1986-03-11) * figure 1 * * column 1, line 49 - column 2, line 24 * * column 5, line 28 - column 6, line 4 *	2,10	
	Chatton of document with indication, where appropriate, of relevant passages  EP 0 562 710 A (ZINK CO JOHN)  29 September 1993 (1993-09-29)  * column 2, line 53 - column 5, line 6; figures 1.5 *  NL 9 102 101 A (VITO TECHNIEKEN B V)  6 May 1992 (1992-05-06)  * page 4, line 2 - page 5, line 13 *  * page 5, line 36 - page 6, line 16 *  * figure 1 *   GB 833 087 A (PETRO CHEM PROCESS COMPANY INC) 21 April 1960 (1960-04-21)  * figure 1 *  * page 1, line 56 - line 63 *  * page 2, line 116 - page 3, line 103 *  EP 0 511 878 A (CALLIDUS TECH INC)  4 November 1992 (1992-11-04)  * column 1, line 40 - column 2, line 36 *  * figure 1 *  US 5 316 469 A (MARTIN MICHAEL J ET AL)  31 May 1994 (1994-05-31)  * column 3, line 41 - line 65 *  * column 5, line 20 - line 59 *  US 4 575 332 A (OPPENBERG ROLF ET AL)  11 March 1986 (1986-03-11)  * figure 1 *  * column 1, line 49 - column 2, line 24 *	EP 0 562 710 A (ZINK CO JOHN) 29 September 1993 (1993-09-29) * column 2, line 53 - column 5, line 6; figures 1,5 *  NL 9 102 101 A (VITO TECHNIEKEN B V) 6 May 1992 (1992-05-06) * page 4, line 2 - page 5, line 13 * * page 5, line 36 - page 6, line 16 * * figure 1 *  GB 833 087 A (PETRO CHEM PROCESS COMPANY INC) 21 April 1960 (1960-04-21) * figure 1 * * page 1, line 56 - line 63 * * page 2, line 116 - page 3, line 103 *  EP 0 511 878 A (CALLIDUS TECH INC) 4 November 1992 (1992-11-04) * column 1, line 40 - column 2, line 36 * * figure 1 *  US 5 316 469 A (MARTIN MICHAEL J ET AL) 31 May 1994 (1994-05-31) * column 3, line 41 - line 65 * * column 5, line 20 - line 59 *  US 4 575 332 A (OPPENBERG ROLF ET AL) 11 March 1986 (1986-03-11) * figure 1 * * column 1, line 49 - column 2, line 24 *

POSTORA ISSESSES FUNCTO

CATEGORY OF CITED DOCUMENTS

The present search report has been drawn up for all claims

particularly relevant it taken alone
 particularly relevant it combined with another document of the same category
 A : technological background
 note written disclosure
 intermediate occument

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THE HAGUE

T: theory or principle underlying the invention
 E: earlier patent document, but published on, or after the filing date
 D: document clied in the application
 L: document clied for other reasons.

8 imminior of the same patent family, corresponding occurrent.

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Date of completion of the search

16 November 2001

## EP 1 108 952 A3

## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 01 10 5492

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

16-11-2001

Patent docum cited in search		Publication date		Patent family member(s)	Publication date
EP 0562710	A	29-09-1993	US CA	5195884 A 2076705 A1	23-03-1993 28-09-1993
			EP	0562710 A2	29-09-1993
	_	_	JP	2633452 B2	23-07-1997
			ĴΡ	6018011 A	25-01-1994
NL 9102101	Α	06-05-1992	NONE		
GB 833087	Α	21-04-1960	NONE		
EP 0511878	Α	04-11-1992	US	5073105 A	17-12-1991
		•	DE.	69204726 D1	19-10-1995
			DE	69204726 T2	07-03-1996
			EP	0511878 A2	04-11-1992
			JP	5215312 A	24-08-1993
US 5316469	Α	31-05-1994	US	5044932 A	03-09-1991
			US 	5135387 A	04-08-1992 
US 4575332	Α	11-03-1986	DE	3327597 A1	07-02-1985
		•	AT ·	27854 T	15-07-1987
			DE	3464283 D1	23-07-1987
			EP	0139085 A1	02-05-1985
			JP	2018281 C	19-02-1996
			JP	7013527 B	15-02-1995
			JP 	60038513 A	28-02-1985 
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